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The images and Calcium XANES spectrum shown below were obtained from a 100 nm thick cross-section of the an explant sample using the scanning transmission x-ray microscope (STXM) at Beamline X1A at the National Synchrotron Light Source. The initial sample was a 1 square cm piece of bovine pericardium which was pretreated with gluteraldehyde, implanted subdermally in a laboratory rat for 28 days, retrieved, washed with distilled water and lyophilized to remove excess water. A small piece of the sample was mounted in epoxy and then cryo-microtomed at -60 C. Other analyses on macroscopic samples have indicated that there is 12% Ca. Companion work using the infrared microscopes at the NSLS has clearly indicated the chemical nature of the calcified deposits as biological apatite.

The XANES spectrum in the Figure 1 is typical of inorganic calcium, exhibiting two distinct absorption bands at x-ray energies near 349.5 and 353.0 eV. The image of Figure 2 was obtained at 349.5 eV with a spatial resolution of 200 nm. The image clearly shows dark areas of 1 to 8 microns in size which correspond to areas of Ca mineralization. The white areas correspond to voids in the sample while the horizontal lines of darker and lighter intensity are due to variation in sample thickness caused during sectioning. Not shown here are images taken at the carbon edge which clearly differential between the pericardium tissue and the embedding epoxy. From these images, it is clear that the calcium has preferentially migrated into one side of the implanted tissue and that a concentration gradient of the calcium deposits is present. Work currently underway includes looking at samples which receives less time to absorb calcium.

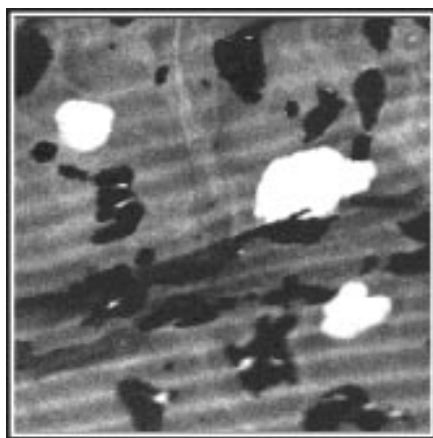


Figure 1.

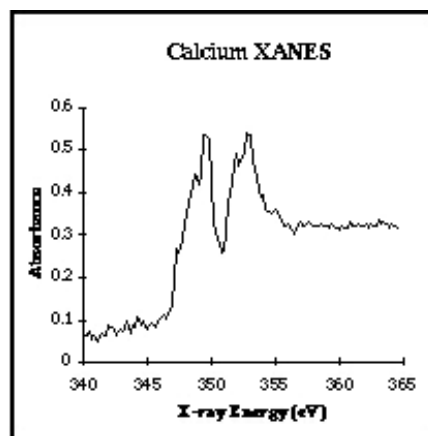


Figure 2.